Douglas-fir Beetle Management Best Practices - Recommendations for Fuel Management Programs

Introduction

The Douglas-fir beetle *(Dendroctonus pseudotsuqae* Hopk.) infests and kills Douglas-fir throughout its range in British Columbia, especially in the dry interior region of the province. Douglas-fir beetle normally kill small groups of trees, but during outbreaks 100 tree groups are not uncommon. Losses can be devastating during periodic outbreaks, where volume losses from 1956 to 1994 were estimated at around 2.4 million m^3. 90 percent of this mortality occurred in the interior of the province. The Douglas-fir beetle prefers hosts such as felled trees, slash, stumps, windfall, over-mature trees, trees damaged by abiotic factors (e.g., fire, snowpress), and trees stressed by defoliation and root disease. Host material over 20 cm is generally preferred, but the beetle will attack trees of smaller diameter as well.

Factors predisposing stand to attack

Some common parameters, which influence Douglas-fir beetle attack preferences, include:

- ❖ Biogeoclimatic zone - IDF is highest hazard;
- ✓ Stand density - higher the density the higher the hazard;
- ✓ Proportion of Douglas-fir - the higher % of host the higher hazard;
- ✓ Diameter of Douglas-fir - larger diameters preferentially attacked;
- ❖ Aspect and slope - south facing slopes of > 40 degrees have highest hazard;
- ❖ Drought, fire, or lightning strikes;
- ❖ Debris piles left unburned, high stumps, and/or bole damage;
- ✓ Previous defoliation by *western spruce budworm* (WSB).
- ✓ Root disease (e.g., Armillaria*)* was the most frequently observed pathogen but laminated root rot is also a predisposing factor.

Best Practices for Fuel Treatment Programs

1. Fuel treatments should be planned outside of the beetle flight window – early spring and summer. Ideally, treatments would occur in the fall into winter. Conducting treatments in the fall/winter will allow for identification of infested trees (fading to bright red-orange crown) and their removal and destruction can be integrated into the overall fuel management plan for the area.
2. All slash *over 20 cm* in diameter should be treated by burning or chipping to prevent emergence of the brood (if infested) or to attract new beetles. If slash piles *do not* contain currently infested wood and cannot be burnt concurrently with treatment they *must* be burnt the following year no later than April 15^{th}.
3. Stumps should be cut as low as possible, *under 30 cm* in height.
4. Burn piles should be located in *clearings* in order to ensure neighbouring Douglas-fir trees are not scorched or scarred. Younger Douglas-fir trees do not have the thick bark characteristic of large mature trees and are easily damaged by burn piles. Cambial die-back due to fire injury significantly increases risk of attack by Douglas-fir beetle even in smaller trees. Ideally, burning of slash will occur *concurrently* with treatment. In addition to burning slash in clearings consideration of *wind direction* when igniting piles is important to minimize damage to residual trees.
5. Trees with root damage or damage to the bole need to be re-examined for attack the summer of the next year, and if they are infested they should be removed *immediately*. Fall trees, buck into 6 inch pieces and move into full sun where cambium will dry out.
6. Post-treatment stands should be carefully watched for evidence of infestation, and infested trees should be removed promptly (if green trees are removed see #4 above for treatment of material).

7. If beetle infested material is present in fuel treatment areas prominent signage should be placed discouraging wood cutters from removing this material, this is especially important in urban interface areas. Contact Cariboo forest entomologist if input is needed and for forest health pamphlets on Douglas-fir bark beetle.

Remedial measures

Anti-aggregation pheromones can successfully "push" the beetles away from vulnerable areas and can be useful to protect small, high value stands such as those near parks and protected areas, campgrounds, residential properties, old growth management areas (OGMAs), and mule deer winter ranges. The anti-aggregative pheromone MCH (methylcyclohexenone) has been used to disrupt or prevent beetle attacks. Attacks have been reduced by over 90% by the application of this pheromone. The use of the pheromone is most useful when there are *low* numbers of trees infested trees, less than 3, or low numbers of susceptible trees. MCH is best applied before beetle flight in these circumstances, for example in an area with blow down or on a damaged or severely stressed tree. If MCH is thought to be an appropriate tool it is recommended that you contact the Cariboo Forest Entomologist for further information about its correct use and deployment.

For more Information contact:

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Selected References:

British Columbia Ministry of Forests and Range. 1995. Bark Beetle Management Guidebook. URL: http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/beetle/betletoc.htm

Humphreys, N. 1995. Douglas-fir Beetle in British Columbia. Forest Pest Leaflet 14, Canadian Forest Service, Pacific Forestry Centre. ISBN 0-662-23498-7, Cat. No. Fo 29-6/14-1995E.

Schmitz, R., Gibson, K. 1996. Douglas-fir Beetle. Forest Insect and Disease Leaflet 5, United States Department of Agriculture, Forest Service. R1-96-87.

Glossary

Debris piles - the unwanted, unutilized, and generally unmerchantable accumulation of woody material such as tops, large limbs, long-butts and other bucking waste that remain in piles as forest residue after timber harvesting.

Large Bucking Waste - woody material of merchantable size that is bucked off for degrade purposes and left on site. Dimensions = diameter of at least 20 cm at the larger end and is at least 1 m long.

Risk - the probability that a stand will be attacked by bark beetles. Risk is dependent on the proximity of the stand to a source of beetles ready to emerge. The higher the beetle population, and the closer it is to the stand, the higher the risk.

Susceptibility - physical tree and site characteristics that make a stand vulnerable to being successfully attacked and killed by bark beetles. In general, the higher the susceptibility, the more damage will occur during a beetle attack.